Amrita School of Engineering, Bengluru-35
21MAT104
Mathematics for Intelligent Systems – 1
Lab Practice Sheet-3

- x=-10:0.01:10; y=x.^2; plot(x,y)
- x=linspace(-10,10,2000); y=x.^2; plot(x,y)

Plots the function $f(x)=x^2$ in [-10,10] by creating vectors x and y
linspace(a,b,c) creates a vector with ' c' equally distributed points in (a,b).

➢ t=-10:0.01:10,plot(t,t.^2)

Plots the function $f(x)=x^2$ in [-10,10] using the parametric form of the function

➢ t=0:0.0001:2*pi, plot(cos(t),sin(t))

Plots the unit circle with centre at origin using parametric form

➢ x=-10:0.01:10; y=x.^2; stem(x,y)

Gives the stem plot of the function $f(x)=x^2$ in [-10,10]

➢ ezplot('x^2',[-10,10])

Plots the function $f(x)=x^2$ in [-10,10]
But this command is not recommended much to be used

To Plot a line segment from a point A(a1,a2) to a point B(b1,b2)

- plot([a1,b1],[a2,b2])
- plot([1,3],[2,4]) will plot a line from (1,2) to (3,4)
- plot([0,10],[0,0]) will plot X axis from (0,0) to (10,0)
- plot([0,0],[-5,5]) will plot Y axis from (0,-5) to (0,5)

Creation of a script file(M-file) for plotting

➢ Click on  on top left of the MATLAB window, to create a new script file(m-file) and type the following in it. After typing save the file as circle and run it. Look out for the figure which appears in the figure window.

```
theta = linspace(0,2*pi,100);
x=cos(theta);
y=sin(theta);
plot(x,y)
axis('equal')
xlabel('x')
ylabel('y')
title('Circle of unit radius centred at the origin')
```

plots a circle with unit radius centred at the origin with title and labels for axes.

- Create a script file(M-file), type the following in it, save the file as multipleplot and execute it. Look out for the figure which appears in the figure window

```
x=-4:0.001:4;
y=x;
plot(x,y,'Color','red')
hold on
y=x.^2;plot(x,y,'linestyle','--')
hold on
plot(x,sin(x),'Color','green','linestyle','-.')
axis([-4 4 -4 4])
```

plots multiple curves in the same figure with different colours and linestyles also giving the length of the axes.

Command 'hold on' is used when multiple curves need to be plotted in the same figure

- Create a script file(M-file), type the following in it, save the file as linearsystem1 and execute it. Look out for the figure which appears in the figure window

```
ezplot('5-x',[-10,10])
hold on
ezplot('4*x-5',[-10,10])
```

Plots to find the solution of the system:
x+y=5, 4x-y=5
(point of intersection of the two lines)

- Create a script file(M-file), type the following in it, save the file as linearsystem2 and execute it. Look out for the figure which appears in the figure window

```
[X,Y] = meshgrid(-3:.05:3);
mesh(X,Y,X+Y,'EdgeColor','blue')
hold on
mesh(X,Y,3*X-Y,'EdgeColor','green')
hold on
mesh(X,Y,2-0.5*X+0.5*Y,'EdgeColor','red')
```

Plots to find the solution of the system:
x+y-z=0, 3x-y-z=0, x-y+2z=4,
(point of intersection of all planes)

- Create a script file(M-file), type the following in it, save the file as helix and execute it. Look out for the figure which appears in the figure window

```
t = -4*pi:pi/50:4*pi;
plot3(sin(t),cos(t),t)
grid on
axis square
xlabel('x')
ylabel('y')
zlabel('z')
title( 'Circular helix')
```

plots a three dimensional curve - circular helix using parametric representation with labelling of axis and title for the figure

Plotting of segmented functions:

% Code to plot the function: $f(x) = \begin{cases} 2-x, & 0 \le x \le 2 \\ x-2, & 2 < x \le 4 \end{cases}$

```
x=linspace(0,4,500);
y1=(x<=2) .* (2-x);
y2=(x>2) .* (-2+x);
y=y1+y2;
plot(x,y)
```

Creation of live script file

Live script file will be more convenient to do the practise questions and assignments as you can save the questions, the MATLAB code for that question and the output together in the live script.

Click on  top left of the MATLAB window, to create a new live script file. You can see the videos given in the link below, to learn more about how to easily work with live scripts.
https://www.youtube.com/watch?v=tNcSpyCa6bc (this video also starts with basic Matlab)
https://in.mathworks.com/videos/using-the-live-editor-117940.html

All the submissions related to lab for MIS-1 should be done in live script and then converted to pdf for submission.

Practise Questions

1. Plot y=sinx , x= -2π to 2π
2. Plot y=tanx , x= -2 to 2.
3. Write a programme to plot a circle with radius 5 and centre at (1,1).
4. Write a programme to plot the ellipse $(x-3)^2+9(y-5)^2=9$. Use parametric representation).
5. Write a programme to plot the ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$ in the second quadrant.
6. Plot y=sinx and y=cosx in the same window with different colours and different line styles between -4π to 4π. Ensure that the X and Y axis are seen in the plot.
7. Solve the given linear system geometrically using MATLAB.

   x + y = 6; 2x – y = 9.
8. Solve the given linear system geometrically as well as by using X= A\B in MATLAB.

   x + y + z = 6; 2x – y + z = 5; 3x + 2y - 5z = 8.
9. Plot the 3-dimensional curve given by y=x and $z=x^2$ in the interval x ϵ (-100,100).
10. Plot the 3-dimensional curve given by y=sinx and $z=x^2$ in the interval x ϵ (-100,100).
11. Plot the 3-dimensional elliptical helix, which has the parametric representation as

    $\overline{r(t)}=[5cost,3sint,t+1],-4\pi<t<4\pi$

    along with the circular helix

    $\overline{r(t)}=[cost,sint,t],-4\pi<t<4\pi$

    in different colours in the same figure window.
12. Plot the function: $f(x)=\begin{Bmatrix}1,-10\le x\le -1\\ -x,\ -1<x\le 1\\ x-2,\ 1\le x\le 10\end{Bmatrix}$,
13. Plot the function: $g(x)=\begin{Bmatrix}\sin x,-\frac{3\pi}{2}\le x\le 0\\ 2x,\ 0<x\le\frac{\pi}{2}\\ \pi-\cos x\ ,\frac{\pi}{2}\le x\le\frac{3\pi}{2}\end{Bmatrix}$

14. Draw a line segment from a point A(x,y) to B(y,z) using a single command in MATLAB, where x is the date, y is the month and z is the year(last two digits) in your date of birth. Also have the X axis and Y axis in the figure.